REMARKS/ARGUMENTS:

Claim 20 is amended. New claims 23-25 are added. Support for the amendment to claim 20 and new claims 23-25 can be found at p. 16, lines 4-20. Claims 20-25 are pending in the application. Reexamination and reconsideration of the application, as amended, are respectfully requested.

The present invention relates to a sapphire monocrystal provided with a smooth cleavage plane, more particularly, to a monocrystal sapphire substrate easier to cleave, so as to be used as a substrate, of thin film growth, such as semiconductor or the like, for electronic parts or structure parts, and to a method of working the same. (Applicant's specification, at p. 1, lines 9-15).

CLAIM REJECTIONS UNDER 35 U.S.C. § 103:

Claims 20 and 21 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Hosoi et al. (U.S. Patent No. 4,908,074) in view of Setsune (JP 61121042), and further in view of Iwasaki et al. (U.S. Patent No. 5,549,978). The Applicant respectfully traverses this rejection. Claim 20, as amended, is as follows:

> A sapphire monocrystal plate for epitaxially growing a semiconductor layer thereon, comprising a sapphire monocrystal having a major face, a working reference plane on a peripheral edge of the plate, the working reference plane being substantially parallel or perpendicular to a plane R of the sapphire monocrystal, wherein the major face is a plane A or a plane C of the sapphire monocrystal and has a surface roughness (Ra) of 0.1 μm or less.

Applicant respectfully submits that Hosoi, Setsune, and Iwasaki cannot render claim 20 obvious, because the combination of references fails to teach or suggest a sapphire monocrystal plate for epitaxially growing a semiconductor layer thereon, comprising a sapphire monocrystal having a working reference plane being

substantially parallel or perpendicular to a plane R of the sapphire monocrystal, wherein the major face is a plane A or a plane C of the sapphire monocrystal and a major face having a surface roughness (Ra) of 0.1 μm or less.

The present invention is directed to providing a sapphire monocrystal having a smoother division plane higher in precision, and a monocrystal sapphire substrate. (Applicant's specification, at p. 4, lines 7-10). The invention applies a plane R to the formation of the smoother surface of the sapphire monocrystal with the use of a fact where the plane R of the sapphire monocrystal is easier to cleave and the cleavage plane is a smooth plane of higher precision. (Applicant's specification, at p. 4, line 24-p. 5, line 3).

Existing methods of working the sapphire monocrystal comprises mechanical working such as grinding, abrading or the like with the use of diamond grindstone, diamond grinding gains, chemical etching working with the use of corroding phenomena, and furthermore, growing finer microcrack, formed on the surface with a diamond needle point pen tip, so as to effect a cleaving, breaking operation. (Applicant's specification, at p. 2, lines 3-9). Such working methods as described above are difficult to obtain a smoother surface in a short time. The mechanical working with diamond grindstone is longer in working time and is higher in working cost. The chemical etching operation, which has an advantage capable of easily compensating the sapphire face smoothly, takes approximately 10 hours for effecting the etching operation of 1 mm in thickness, and is hard to obtain the smooth face of sub-micron unit. Also, the breaking, working method with the diamond needle point pen tip is worse in the accuracy of the worked surface, and is difficult to obtain the smooth surface. (Applicant's specification, at p. 2, lines 10-21). The present invention avoids the use of these undesirable methods.

The Office relies on Hosoi for teaching a sapphire monocrystal plate comprising a sapphire monocrystal having a major face, wherein the major face is

plane A or a plane C of the sapphire monocrystal. However, Hosoi does not describe the major face being a plane A or plane C. According to Hosoi (column 6, lines 23-29), an epitaxial growth plane D is off-angle with respect to plane C (0001). Therefore, this epitaxial growth plane D can be neither a plane C nor a plane A.

Neither Setsune nor Iwasaki disclose any use for forming a semiconductor layer thereon. Therefore, one of ordinary skill in the art would not be motivated to combine these references with Hosoi.

In addition, neither Hosoi nor Setsune teach or suggest a major face of a sapphire monocrystal having a surface roughness (Ra) of 0.1 μm or less, and neither reference is relied upon by the Office for such. Instead, the Office relies upon Iwasaki for supplying this teaching. In Iwasaki, however, "A sapphire substrate C face (the (0001) plane of an α-Al_2O_3 substrate) was polished into a mirror surface by using a mechanochemical polishing process until the average surface roughness became about 2 nm when measured by a probe type surface roughness meter with a probe radius of 0.2 μm." (Iwasaki, column 24, lines 46-51). Consequently, Iwasaki achieves a smooth surface using a process the present invention seeks to avoid. As such, there is no motivation to combine the teaching of Iwasaki in the manner suggested by the Office. The Applicant respectfully submits that absent the impermissible hindsight reasoning gleaned from the present invention, there is no suggestion or motivation in the cited references to combine Iwasaki with Hosio and Setsune.

In light of the foregoing, Applicant respectfully submits that the cited references could not have made claim 20 obvious, because the combination of references fails to teach or suggest each and every claim limitation. Claim 21 depends from claim 20 and cannot be made obvious for at least the same reasons as claim 20. Withdrawal of these rejections is thus respectfully requested.

Claim 22 stands rejected under 35 U.S.C. § 103(a) as being unpatentable over Hosoi, Setsune, and Iwasaki as applied to claims 20-21 above, and further in view of Nitta et al. (U.S. Patent No. 5,403,773). The Applicant respectfully traverses this rejection.

Claim 22 depends from claim 20, and as such includes all the limitations of claim 20, and therefore, cannot be rendered obvious over Hosoi, Setsune, and Iwasaki, for the same reasons as discussed above. Nitta cannot remedy the defect of Hosoi, Setsune, and Iwasaki and is not relied upon by the Office for such. Instead, the Office cites Nitta for teaching that a wafer is scribed along cleavage lines and this scribing will inherently form a microcrack.

In light of the foregoing, Applicant respectfully submits that the cited references could not have made claim 22 obvious, because the combination of references fails to teach or suggest each and every claim limitation. Withdrawal of this rejection is thus respectfully requested.

New claims 23-25 are patentable for at least the same reasons discussed above.

In view of the foregoing, it is respectfully submitted that the application is in condition for allowance. Reexamination and reconsideration of the application, in view of the foregoing remarks, are requested.

If for any reason the Examiner finds the application other than in condition for allowance, the Examiner is requested to call the undersigned attorney at the Los Angeles, California telephone number (213) 337-6810 to discuss the steps necessary for placing the application in condition for allowance.

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If there are any fees due in connection with the filing of this response, please charge the fees to our Deposit Account No. 50-1314.

Respectfully submitted,
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Date: February 13, 2004

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